

TITLE OF THE INVENTION

Automotive machine for producing carriageways

BACKGROUND OF THE INVENTION

[0001] The invention relates to an automotive machine for producing carriageways in accordance with the pre-characterizing clause of claim 1. Such machines are needed for the conditioning of material, namely the stabilization of insufficiently stable soils, the pulverization of hard asphalt pavements to the recycling of bound or unbound carriageway surfaces.

[0002] The known construction machines mostly show a working drum that revolves in a working chamber and is generally arranged in a height-adjustable manner for adjustment to the required milling depth and the surface to be worked. An adjustment of the slope can be effected by means of the running gear.

[0003] Adapted to the particular applications, the particular processes, such as removing and crushing the milled carriageway material, adding binding agents, mixing and spreading added materials, take place in this working chamber that is confined by a cover. A detailed explanation of the tasks to be solved by such machines and of the problems occurring can be inferred from WO 96/24725, which is referred to herewith in terms of content.

[0004] In the construction machine described therein, the cover is firmly attached to the machine chassis. The combustion engine for the drive power is mounted on a pivoting bracket, in the pivoting arms of which the milling drum is also mounted on both sides. The device, consisting of pivoting bracket with combustion engine and pivoting arms with milling drum, is mounted to pivot in the machine chassis. This arrangement influences any energy, substance and signal flow from and to the combustion engine in an unfavourable manner.

[0005] A further prior art is known from DE 3921875. The machine described therein shows a milling drum mounted between two pivoting arms that is surrounded by a height-adjustable cover. The combustion engine for the drive shows a hydraulic pump for the milling drive and a drive pump, both of which are coupled to a combustion engine arranged in front of the front axle of the running gear in a longitudinal direction. Here, the combustion engine is arranged in a fixed manner at the machine chassis but in an unfavourable manner in front of the operator's platform, which impedes the view, and in particular in front of the front axle, which adversely affects the position of the machine's centre of gravity. Furthermore, the hydraulic drive of the milling drum has a poor efficiency.

[0006] US 5354147 describes a prior art with the features of the pre-characterizing clause. Of disadvantage here are the considerable design effort and the unfavourable weight distribution of the machine weight due to the combustion engine installed in front of the front axle. The arrangement of the engine in a longitudinal direction requires an additional gearbox, which makes the machine more expensive and more susceptible and reduces the efficiency of the milling drum drive.

[0007] Starting from a prior art in accordance with US 5354147, the purpose of the invention consists in creating an automotive machine for producing carriageways that facilitates a mechanical direct drive of the working drum at a generally more stiff drive system and improved position of the centre of gravity.

[0008] The characteristics of claim 1 serve to provide a solution to this purpose.

[0009] The invention provides in a favourable manner that the combustion engine is arranged in a fixed manner at the machine chassis between the pivoting arms and that at least one mechanical power

transmission device, together with the working drum mounted in the pivoting arms, can be pivoted about the output shaft of the combustion engine.

[0010] The advantage of the mechanical drive is that, due to the direct coupling of the combustion engine and the milling drum, an increased torque can be realized and drive losses are reduced, since no mechanical energy needs to be converted into hydraulic energy first and then back again into mechanical energy. At the same time, the drive system is stiffer when compared to a hydraulic drive system.

[0011] Arranging the output shaft of the combustion engine parallel to the shaft of the working drum allows the working drum with the power transmission device to be pivoted about the axis of rotation of the output shaft in a favourable manner without requiring additional mechanical elements. In doing so, the combustion engine can be installed transversely to the direction of travel in a favourable manner. Because the combustion engine is attached to the machine chassis in a fixed manner, suction and exhaust pipes as well as supply lines (e.g. for fuel, cooling liquid, engine electrics, hydraulics, etc.) need not be designed in a flexible manner.

[0012] Arranging the combustion engine between the support of the pivoting arms in the machine chassis has the advantage of a space-saving design and enables the power transmission device to be coupled directly to the output shaft at the combustion engine.

[0013] Between the output shaft and the power transmission device, a clutch can also be arranged in combination with a pump transfer gearbox.

[0014] In one preferred embodiment, it is intended that the output shaft of the combustion engine is arranged coaxially with the crankshaft axle of the combustion engine.

[0015] An operator's platform is preferably arranged in front of the combustion engine in the direction of travel. In a particularly favourable design, the operator's platform can be arranged in front of the front wheels. This arrangement has the additional advantage that the operator's platform can be movable in transverse direction.

[0016] The running gear can show front and rear wheels, whereby the front or the rear or all wheels are driven. The operator's platform can preferably be arranged in front of the axles of the front wheels.

[0017] The running gear preferably shows front steerable and/or rear steerable wheels.

[0018] The arrangement of the combustion engine between the drive axles is favourable for the weight distribution and enables the contact pressure on the working drum to be increased.

[0019] It is understood that the running gear can also show other drive means, e.g. track chains, in lieu of wheels. The preferred embodiment is provided with individual wheels that can, however, also be jointly controlled.

[0020] At least one of the pivoting arms, which are mounted to pivot in the machine chassis, receives the power transmission device between the combustion engine and the working drum.

[0021] In principle, however, there is also the possibility of guiding the output shaft through both sides of the transversely installed combustion engine and to provide a power transmission device in both pivoting arms. If a mechanical power transmission device is intended on one side only, the pivoting arm on the other side can be designed in a flat manner so that milling close to the edge is possible on this so-called zero side, i.e. the distance of the front edge of the working drum from an obstacle can be minimized on this zero side.

[0022] The working drum is coupled to a lifting device showing a link mechanism and attached to the machine chassis, by means of which the milling depth can be set.

[0023] The working drum can be coupled to one lifting device each on both front ends, whereby the movements of both lifting devices are synchronized.

[0024] In detail, the lifting device can show two pull rods running parallel to each other that are flexibly mounted at the pivoting arms on both sides at the working drum.

[0025] The lifting device can show at least one two-armed lever, one lever arm of which is connected to the free end of the pull rods and the other lever arm of which is flexibly coupled to a piston cylinder unit that is attached to the machine chassis.

[0026] The link mechanism enables the transmission of high forces due to the leverage ratio and enables a large stroke at a low design height.

[0027] In case of an arrangement of two-armed levers on both sides, it is intended that both levers are connected to each other in a non-rotatable manner by a coupling device that runs parallel to the shaft of the working drum and is mounted in the machine chassis, e.g. a connecting pipe.

[0028] In the following, embodiments of the invention are explained in more detail with reference to the drawings. The following is shown:

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Fig. 1 is a side view of the machine in accordance with the invention in which the working drum is in an idle position.

[0030] Fig. 2 is an illustration in accordance with Fig. 1 in which the working drum is in the milling position.

[0031] Fig. 3 is a top view of the machine in accordance with the invention.

0032] Fig. 4 is a second embodiment with a cover attached to the machine chassis in a fixed manner.

[0033] Fig. 5 is a top view of the machine in accordance with Fig. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] Fig. 1 shows the machine 1 for producing and working carriageways by stabilizing insufficiently stable soils or by recycling road surfaces, with a machine chassis 4 supported by a running gear 2. The running gear 2 shows two each rear and front wheels 6, 8 that are attached to lifting columns 12 in a height-adjustable manner and that can be raised and lowered independently of each other or simultaneously. It is understood that other drive means, e.g. track chains, can also be provided in lieu of the wheels 6, 8. The lifting columns 12 are attached to the machine chassis 4.

[0035] Both axles of the running gear formed by the front and rear wheels 6, 8 respectively can be steerable.

[0036] As can be seen from Figs. 1 and 2, an operator's platform 10 for one operator is arranged at the machine chassis 4 above the front wheels 8 or in front of the front wheels 8, whereby a combustion engine 32 for the travel drive and for driving a working drum 20 is arranged behind the driver. In this way, the operator's platform 10 can be ergonomically optimized for the machine operator.

[0037] The working drum 20 which rotates in opposition to the direction of travel and the shaft of which extends transversely to the direction of travel, is mounted to pivot in relation to the machine chassis 4 so that it can be pivoted from an idle position, as depicted in Fig. 1, to a working position, as depicted in Fig. 2, by means of pivoting arms 42 arranged on both sides. Each pivoting arm 42 is mounted in the machine chassis 4 at one end and receives the support of the working drum 20 at its other end.

[0038] It is also possible to operate the machine 1 in a reverse direction, whereby milling then takes synchronous to the direction of travel.

[0039] The working drum 20 is, for example, equipped with cutting tools not depicted in the drawings in order to be able to work a ground surface 14.

[0040] The working drum 20 is surrounded by a cover 28 that, as can be seen from Fig. 1, can be raised together with the working drum 20 by means of the pivoting arms 42.

[0041] In the operating position, as can be seen from Fig. 2, the cover 28 rests on the ground surface 14 to be worked while the working drum 20 can be pivoted further down in accordance with the milling depth. In this way, a mixing chamber 24 with a variable mixing chamber volume that depends upon the milling depth results between the cover 28 and the working drum 20. The working drum 20 shows swivelling flaps 25, 27 at its front and rear edges. The front flap in the direction of travel is opened, and the rear flap in the direction of travel can be used as a scraper blade.

[0042] The maximum lowering of the cover 28 is determined by a limiting device 70 that consists, for example, of two threaded bars arranged at a lateral distance to each other and guided vertically through the machine chassis 4, whereby the limitation of the maximum possible downward lowering can be set by means of nuts on the threaded bar, which rest on the machine chassis 4.

[0043] The arrangement of the limiting device 70 in the top view can be seen from Fig. 3.

[0044] Accordingly, it is intended that such a cover 28 rests on the ground surface 14 in a floating manner. Alternatively, the cover 28 can be attached to the machine chassis 4 in a fixed manner, as shown in the embodiments of Figs. 4 and 5.

[0045] In this case, the running gear must show lifting columns 12 in order to be able to perform a height adjustment of the cover by means of the lifting columns.

[0046] Lifting columns 12 for the wheels 6, 8 are, on the other hand, not compulsory in the embodiments shown in Figs. 1 to 3.

[0047] A lifting device 50 for the working drum 20 consists, in detail, of two pull rods 52, flexibly attached at the front ends of the working drum on both sides, which run parallel to each other and are articulated at one or two two-armed levers 54 that are mounted in the machine chassis 4.

[0048] The two-armed lever 54 is flexibly connected at one lever arm 56 to the free end of the pull rods 52 and at the other lever arm 58 to a piston cylinder unit 60 that is attached to the machine chassis 4.

[0049] The lever arms 56, 58 of the two-armed lever 54 run at an angle of approx. 90° or more to each other. The two-armed levers 54, preferably arranged on both sides, are connected to each other in a non-rotatable manner via a coupling device 64 mounted in the machine chassis 4, preferably a pipe rod, so that a synchronous and parallel movement of the pull rods 52 is effected when actuating the at least one piston cylinder unit 60. In this way, it is ensured that the lifting device on both sides of the working drum 20 moves in a uniform manner and cannot tilt.

[0050] It is understood that two levers connected to the coupling device 64 in a non-rotatable manner can also be provided in lieu of one two-armed lever 54. Figs. 1 and 4 show two alternative types of a two-armed lever.

[0051] The combustion engine 32 is arranged between the pivoting arms 42 in such a way that the output shaft 34, which preferably runs coaxially with the crankshaft 40, simultaneously forms the axis of rotation for the pivoting arms 42, the working drum 20 and the power transmission device 36 arranged in at least one pivoting arm 42.

[0052] A clutch is preferably arranged between the output shaft 34 and the power transmission device 36 in order to be able to disconnect the working drum drive. Alternatively, a clutch can also be used in connection with a pump transfer gearbox.

[0053] The combustion engine 32 is preferably installed transversely to the direction of travel in a space-saving manner between the pivoting arms 42.

[0054] The power transmission device 36 preferably consists of belt drives, whereby one belt pulley is located on the output shaft 34 and another one is coupled to the working drum 20. The drive belts are then additionally deflected and tensioned via a tension pulley, as can be seen from Figs. 1 and 2.

[0055] Figs. 4 and 5 show a second embodiment in which the operator's platform 10 is arranged farther in front of the front wheels 8 or in front of the axles of the front wheels 8 respectively, and can thus be moved transversely in a favourable manner. As can be seen from Fig. 5, the operator's platform 10 can be moved even beyond the outer perimeter of the machine on one side of the machine, preferably the zero side.

[0056] This is also of particular advantage when a working drum 20 is used that extends beyond the frame width of the machine chassis. Such a

working drum 20 is used, for example, when stabilizing insufficiently stable ground surfaces, as in this case the efficient working width can be increased due to the reduced performance requirements.

[0057] Deviating from the embodiment of Figs. 1 to 3, the cover is articulated at the machine chassis 4 in a fixed manner so that a height adjustment of the cover can be effected solely by means of the lifting columns 12 for the wheels 6 and 8.